NASA Activities

National
Aeronautics and
Space
Administration

Vol. 8, No. 6

June 1977

Cover

A Space Memento—The round piece of Moon rock shown at the upper center of a gothic window in the Washington Cathedral—one of the showplaces of the nation's Capitol—is more than three billion years old. Eight years ago, Apollo 11 astronauts picked up the piece of basalt rock from the floor of the Sea of Tranquility. The church window commemorates the exploration of space.

NASA Activities is published monthly by the National Aeronautics and Space Administration for the information of the Agency's employees.

Contributions and recommendations are solicited from headquarters and field centers, and should be addressed to the Office of Public Affairs, Code FP, Washington, D.C. 20546

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Annual subscription rate: $11.55 domestic; $14.45 foreign. Price per single copy: $1.00 domestic, $1.25 foreign. Back issues not available.

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Announcement from Washington

Dr. Robert A. Frosch Nominated as NASA Administrator

President Carter nominated Dr. Robert Alan Frosch to be NASA's new Administrator on May 23, 1977. He succeeds Dr. James C. Fletcher, whose resignation became effective May 1. The U.S. Senate must confirm Frosch's appointment before he assumes his job as NASA's chief.

Frosch has been a consultant to NASA's top management since April 20, commuting periodically from his post at Woods Hole, Mass., as Associate Director for Applied Oceanography at the Woods Hole Oceanographic Institution.

He brings to NASA impressive credentials, a broad variety of experience in science and government, and a record of distinguished public service.

Frosch, 49, was educated in the public schools of New York City, taking his A.B. Degree from Columbia University in 1947, an A.M. in 1949 and a Doctorate in theoretical physics from the same university in 1952. Since that time, his career has been in the field of marine and related geophysical sciences, as research scientist, as director of research laboratories and various research projects, and as an executive of science-related activities in the Department of Defense and the United Nations. He has been responsible for such diverse projects as the underwater acoustic exploration of the Norwegian Sea; United Nations environmental programs in Nairobi, Kenya; and nuclear test detection and advanced research projects in the Department of Defense.

For six-and-a-half years (from late 1966 to early 1973) he held the critical post of Assistant Secretary of the Navy for Research and Development, initiating important improvements in Navy R&D which earned him the Navy Distinguished Public Service Award in 1969. He holds many other awards, and he is the author of a number of professional papers.

Frosch is active in some nine professional societies and is a member of a number of scientific boards, committees and academies concerned with Earth sciences, earthquake prediction, energy, and maritime transportation.

Our prospective Administrator is married and the father of two teenage daughters.

NASA

Viking Achievements Win Top Honors

In ceremonies held at the Langley Research Center on April 19, at NASA's Jet Propulsion Laboratory on April 25, and at the Martin Marietta Corp. in Denver on April 26, many individuals and units within the three organizations were presented with the highest awards the agency can offer. Awards and medals were given for: Group Achievement, Public Service Group Achievement, Public Service, Exceptional Service, Exceptional Scientific Achievement, Outstanding Leadership, Distinguished Public Service and Distinguished Service.

Former NASA Administrator Dr. James C. Fletcher stated, in recognition of Viking's tremendous achievements, that the names of the three organizations "will go down in the annals of history and human accomplishment."

In his foreword to the program, Fletcher said: "Scientists and engineers from universities, government and industry throughout the country and many other skilled and talented people in support have truly blazed a trail for humanity across the far frontiers of space. Because of their sustained and dedicated efforts over a period of many years, we have now had extensions of human intelligence on Mars for more than six months, providing us with unprecedented data on the nature, origins and evolution of the solar system and the universe itself.

"Citations and awards to such men and women are very special indeed because they are made for unique accomplishments, for things done which have never been done before. The recipients are among the most imaginative and resourceful individuals of our era."

The awards were presented by Fletcher, and Drs. Alan M. Lovelace and John E. Naugle.

Langley Tests Underwater Pollution Detector

A remote monitoring device developed at NASA's Langley Research Center is being tested in the waters of New York's Upper Bay. The instrument contains sensors designed to detect and monitor the human bacteria (coliforms) often found in waste materials dumped into coastal zone waters.

The demonstration test was conducted off Caven Point, N.J., just south of the Statue of Liberty, during the week of April 7-14. The test is a cooperative project between NASA and the U.S. Environmental Protection Agency Region II surveillance and analysis division.

Successful performance of the NASA detection system will lead to a more elaborate NASA-EPA test program this summer at the Ambrose Lighthouse, located in the New York Bight. That program will seek to evaluate the system in deep water.

The instrument, called a remote monitoring platform, contains 10 bacteria sensors, a radio transmitter, and batteries for power. The platform sits on the bottom of the bay in about 4½ meters (15 feet) of water. A life-sustaining line rises from the platform to a small buoy and antenna that float atop the water.

Data on the bacteria detected by the sensors are radioed to a control center where they are monitored and analyzed to provide information about concentrations. The test control center is located inside a NASA truck on shore, about three miles from the buoy. EPA representatives have a mobile laboratory at the test site to make standard method tests for comparisons with information obtained from the NASA system.

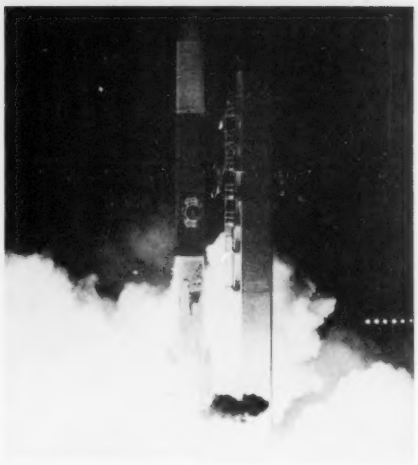
The sensor monitoring technique is based on an electrochemical detection method developed by Dr. Judd Wilkins of Langley. The system is an improvement over standard detection methods because it is automated and provides rapid test data analysis. The electrochemical method of coliform detection is based on the fact that coliforms metabolize molecular hydrogen, and a linear relationship exists between initial cell concentration and the time the hydrogen is evolved.

Ordinarily, coliform samples must be collected by hand, and testing and analysis require from 24 to 96 hours. The electrochemical method can complete analyses in as few as seven hours.

Further development of the Langley system could lead to the deployment of detection instruments in many coastal and inland waterways, providing continuous monitoring of human bacterial concentrations in waters throughout the United States.

European Scientific Satellite Launched

Europe's first geosynchronous orbit scientific spacecraft, GEOS/ESA, failed to reach its designated orbit after it was launched on April 20 from the Kennedy Space Center by a Delta rocket. Its function was to explore the magnetic and electric fields 36,000 kilometers (22,300 miles) above Earth at the equator. These fields, which are very weak, are being modified continually by the flow of electric particles from the Sun. A knowledge of their behavior is



European Satellite—Launch of GEOS from complex 17 at Cape Canaveral looked good. Later, trouble developed when the spacecraft reached orbit.

necessary for a more complete understanding of Earth's environment and a better understanding of the interaction of the solar wind with Earth's magnetic field.

The nine onboard experiments, devised by 11 European scientific groups, were designed to detect and measure the magnetic and electric fields surrounding Earth and the varying flow of particles emitted by the Sun.

Countdown and launch seemed normal until the separated spacecraft appeared over the first downrange tracking station, when it was determined that it did not have the proper attitude, spin rate or velocity to achieve the desired orbit.

"Preliminary evaluation of data indicated an electrical short circuit in the second stage ring caused the separation of the second and third stages to take place too soon," said Charles Gunn, NASA Delta project manager.

Project scientists explained that because the spacecraft was not placed in the intended orbit, certain of the planned measurements can be made only part of the time. They also said that the lifetime of the satellite might be reduced because of damage by intense radiation.

On April 27, GEOS was placed in a 12-hour elliptical orbit with an apogee of about 38,400 kilometers (23,846 miles), a perigee of 2,100 km (1,304 mi.), and an inclination of 26.3 degrees. The satellite maneuvers between approximately 35 degrees E., 142 degrees W. In that orbit, GEOS is able to accomplish at least part of its mission inasmuch as it can track various elements for some seven to eight hours daily through a German tracking station. ESA and NASA presently are discussing the possibility of receiving data from tracking stations at Alaska, Hawaii or Goldstone (Calif.).

The malfunction in the mission ended a string of 29 flawless performances by the Delta. The reimbursable launch results in a charge of $14.3 million to be paid to NASA by ESA.

A second GEOS launch scheduled for July 1979 may take place earlier, officials said.

Solar Energy Used at Space Museum

A museum that provides a simulated space experience for guests at the Alabama Space and Rocket Center will be heated by sunshine to show visitors how a solar heating system operates. The Marshall Space Flight Center purchased the required five large solar collectors for the heating system and the museum will pay for building changes needed to accommodate the new hardware.

The system is expected to provide 70 percent of the heat requirement of the Lunar Odyssey, the simulated space ride housed in a modified tank from the Saturn launch vehicle program.

The University of Alabama in Huntsville, under contract to the Marshall center will provide the engineering and supervise the installation and checkout. Local service firms were employed for the actual installation.

The system consists of 22 square meters (240 square feet) of collectors, a 1,892-liter storage tank, and associated controls, heat exchangers, pumps and duct work. Consideration also is being given to supplementing the hot water system of the main museum building with solar heated water from the new system.

Students Discuss DNA Research via Satellite

Two groups of students and faculty members 3,000 miles apart were linked via the joint U.S.-Canada Communications Technology Satellite to discuss DNA experimentation with Dr. Donald Fredrickson, director of the National Institute of Health. Dr. Frederickson's office was responsible for developing the new guidelines which regulate NIH funded research in the area of genetic engineering.

The program was transmitted from the NIH facilities in Bethesda, Md. to the NASA/Ames Research Center via CTS, last April. Students and

faculty on both coasts had the opportunity to informally discuss with Fredrickson the implications of DNA research and the current NIH regulations that are being debated nationwide.

The project uses the CTS, stationed some 22,000 miles above the Earth. The test program provides new opportunities for students to have direct access to the science policy establishment as well as demonstrate the economic feasibility of using audio-video satellites for educational purposes.

The experimental program was developed by the Forum for the Advancement of Students in Science and Technology, in cooperation with the NASA and the NIH.

Rings Around Uranus

The discovery of rings around the planet Uranus, announced at a recent Ames Research Center press conference, was called the most significant planetary scientific event since the existence of Pluto was confirmed in 1930. Previously the only planet known to have rings was Saturn. Now, scientists are comparing the five thin rings measuring 6 to 100 kilometers (3.7 to 62 miles) of Uranus with the three Saturn rings, which are thousands of kilometers wide.

Dr. James Elliot, senior research associate at Cornell University's center for radiophysics and space research, assisted by graduate student Edward Dunham and computer programmer Douglas Mink, made the discovery March 10 while they were aboard NASA's Kuiper Airborne Observatory observing the temporary disappearance (occultation) of a faint star behind Uranus.

The expedition was carried out by the Ames center's Kuiper Observatory project team, headed by Carl Gillespie, expedition manager. Observations were made at 12,300 meters (41,000 feet) altitude, 2,000 km (1,200 mi.) southwest of Australia over the southern Indian Ocean.

According to Elliot and his associates, the five rings orbiting Uranus lie 18,000 km (11,000 mi). from the cloud tops of the planet. The rings appear to consist of four thin inner rings that follow nearly circular orbits around the planet, and one thick outer ring, whose orbit may not be exactly circular.

Observations of the Uranus occulation made independently at Perth, Australia, by Robert Millis of Lowell Observatory, and by astronomers at Capetown, South Africa, agree with the interpretation of at least five rings surrounding the planet.

Uranus is the seventh planet out from the Sun, one

A Fruitful Voyage Ends—Dr. James Elliot of Cornell University (left) congratulates Jim McClenahan of the Ames center, assistant mission manager of the NASA Kuiper Airborne observation on his return to Ames with the C-141 aircraft. Robert Cameron, chief of Ames' medium altitude missions branch (center) adds his congratulations.

Flying Observation Post—NASA's airborne infrared observatory, a Lockheed C-141 jet transport equipped with a 91.5 cm (36 in.) telescope, cruises with its telescope port open. The high-flying telescope allows astronomical observations through use of wave lengths of light unusable at Earth's surface because of the interference of moisture in the atmosphere. The craft is operated as a national facility by NASA's Ames Research Center.

of the giants of the outer solar system. It is almost 1.6 billion km (a billion mi.) beyond Saturn, and is unique in "lying on its side" with its rotation axis almost in its orbital plane. The rings have never before been observed because the light reflected from the planet is sufficiently bright to obscure the lesser reflections from the rings under normal viewing conditions, Elliot said. He named the rings for the first five letters of the Greek alphabet—alpha, beta, gamma, delta and epsilon.

Ames' Kuiper Observatory, from which the observations were made, is a very much modified C-141 aircraft, and is a national facility available to astronomers. Named for pioneer planetary astronomer Gerard P. Kuiper, who discovered Uranus' fifth moon, it carries the world's largest airborne telescope and has made a number of important discoveries.

For the Uranus flight, the C-141 flew far out over the southern oceans. It flew far enough south to be well within the shadow of Uranus and far enough into the Earth's night hemisphere to see occultations of the rings on both sides of the planet as well as to be above any clouds. This combination of factors was not possible from any single groundbased observatory and, in fact, several ground observatories were clouded out.

Viewing of Uranus was done through the observatory's 91-centimeter (36-inch) telescope, stabilized by gyroscopes and a tracking system that compensates for changes in altitude of the plane during flight. The C-141 flew above 75 percent of the Earth's atmosphere. Data were displayed for the Cornell observers on a television screen and variations in intensity of the light were recorded on magnetic tape and plotted automatically on graph paper.

Elliot and his associates observed the occultation of the star SAO 158687 by Uranus to learn the planet's precise diameter and to study the composition and temperature of its atmosphere by recording changes in the light intensity from the star as it passed near and then behind the planet. Discovery of the planet's rings was an unexpected result.

Approximately 40 miutes before the star was scheduled to pass behind Uranus, Elliot and his associates noticed a sudden blackout of the light from the star lasting approximately seven seconds. During the next nine minutes, the light from the star was blocked out four more times. No changes in light coming from the star were recorded during the next 30 minutes. The star then moved behind the main body of the planet, which blocked out its light for about 25 minutes.

Observations made as the star moved beyond Uranus confirmed that Elliot and his colleagues had indeed observed rings around the planet. The light from the star was blocked out another five times at intervals corresponding to the first blackouts. Had the original blackouts been caused by moons or other small objects, it is unlikely that they would have been seen on both sides of the planet, Elliot said. He suspects that the rings are composed of material present during the formation of the solar system—material that never coalesced into moons—or that they are the remnants of a moon or moons which disintegrated at a later time in Uranus's history.

New Appointee at GSFC

Fidel Rul recently was made station director of the Goddard Space Flight Center tracking station at Agana, Guam. As such, he is responsible for the technical and administration management of the station. Rul previously was the assistant station director of the Goldstone Tracking Station in Barstow, Calif. He came to Goddard in March 1965. In addition to his work with the data systems section of the network directorate at Goddard, he was the Spanish-speaking program coordinator at the center. Rul is a native of Alice, Texas, and a graduate of Texas A&M College.

Moon Rock Enshrined

The world-famed Washington (D.C.) Cathedral installed as the crowning glory of its 19-foot high gothic window—described as a spectacular blue-toned stained glass window that commemorates the exploration of space—a small piece of Moon rock ("Piece 230") collected by Apollo 11 astronauts. Dean Francis B. Sayre said that the cathedral's rock, estimated to be 3½ billion years old and about the size of a silver dollar, is the only one given by NASA to a nongovernmental institution.

The basalt rock, collected from the Sea of Tranquility in 1969 by the first man to land on the Moon, was leaded into the window last April. It rests at the center of a design that was inspired by photos brought back by NASA's early space flights. The design suggests planets in a night sky flecked with stars and a tracery of red around the edges gives promise of the rising sun. Designed by Rodney Winfield, the installation was begun in July 1974, but the extremely valuable piece of Moon rock was kept in a vault until recently when artisans were able to set it permanently into its place in the design.

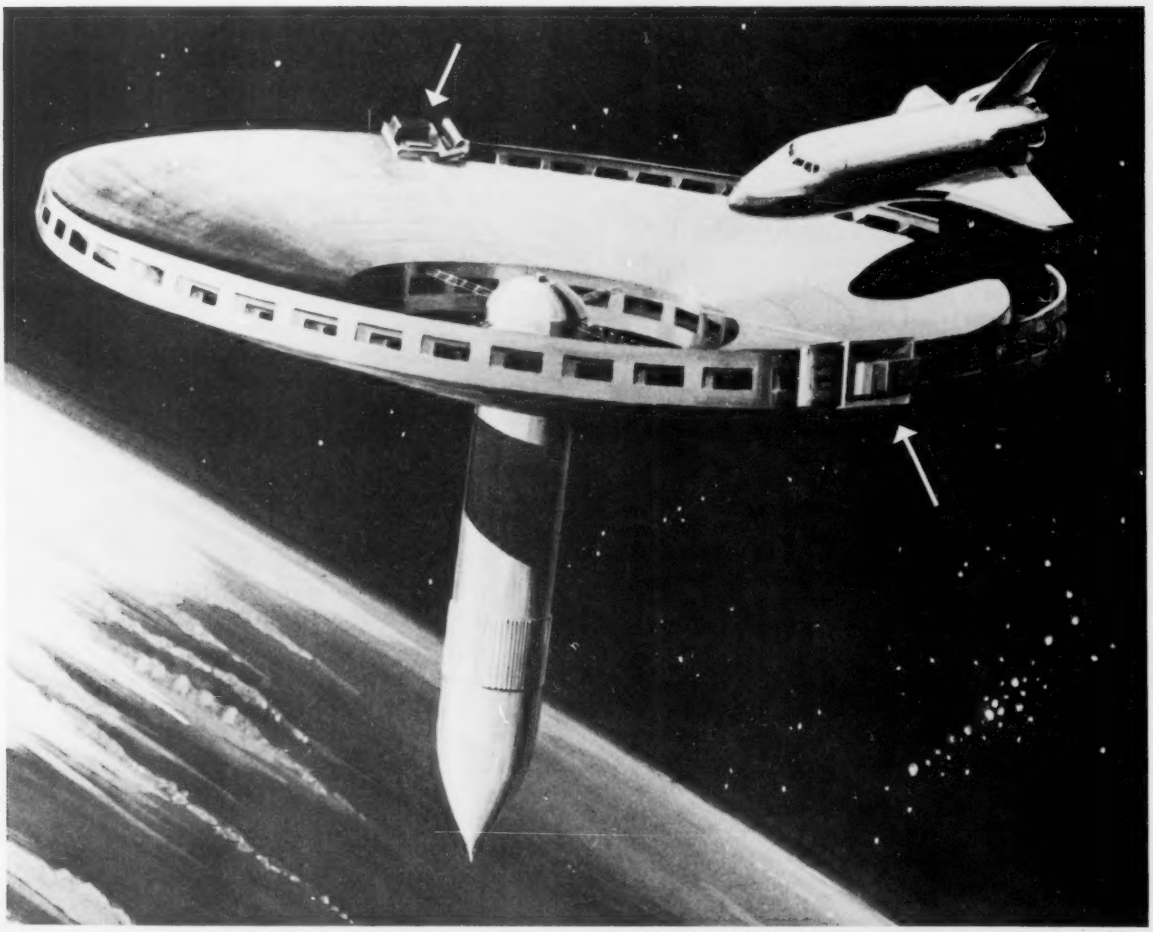
Spinning of Space Webs Studied

NASA's Marshall Space Flight Center has issued a request for quotations to industry for a "Design Study of the Teleoperator Space Spider for Building Large Space Structures."

The "Space Spider" concept formulated by Marshall engineers involves a device that would be capable of constructing large structures such as satellite power systems and antennas in space. Carrying a roll of prestamped material, the Spider would attach itself to the rim of an established core and, traveling by means of a crawler-type drive, would spin a newly formed ribbon of material around the rim. The action would continue until a particular diameter was reached.

The Teleoperator Space Spider has been proposed for flight aboard the Space Shuttle in the 1980's.

"Spiders" Build in Space—This artist's concept depicts two proposed Teleoperator Space Spiders building a structure for a solar power satellite onto a Space Shuttle external tank. On completion of such a structure, the external tank could become a control center for space operations, a crew habitat for Shuttle astronauts and a focal point for various space missions. The Shuttle orbiter is shown at right hovering over the solar power satellite.



Expanded Insect Study

In an effort to gain more information on the effect of insects that collect on the leading edge of aircraft wings, a small jet transport flying out of NASA's Dryden Flight Research Center was flown at the Kennedy Space Center in early April to seek out bigger and more varied types of insects.

The program is being conducted jointly with NASA's Langley Research Center as part of NASA's aircraft energy efficiency program, aimed at developing a 1985 transport with a potential 20- to 40-percent fuel savings.

The advanced long-range aircraft probably will make use of laminar flow control technology and thus is dependent upon smooth air flow over the wings, but research has revealed that impacted insects stuck on the leading edge of the wing can trip the air flow and cause it to become turbulent. This phenomenon cancels out the increase in efficiency that can result from laminar flow.

The small jet transport, equipped with a modified wing, flew 7½ meters (25 feet) above Florida swamp grass in recent tests similar to earlier ones carried out in southern California. On a typical flight after the aircraft lands, the insects collected on several specially coated panels on the wing are documented and measured.

Insect Study—A small jet transport plane flew over Florida for a week in a continuing experiment involving how dead insects collected on aircraft wings may impede flight efficiency.

Additional tests planned for June or July at the Johnson Space Center may provide data on different types, sizes, or quantities of insects, which will be added to the information collected in California and Florida.

Ocean Research Project Is Completed

A major aerial study of the Pacific Ocean along the West Coast from the Mexican border to Alaska, was conducted throughout the month of March by a scientific team representing 23 governmental and academic groups. The airborne survey ended in late March.

The program is part of NASA's continuing ocean condition monitoring and data utility program, data from which will be of assistance to the Seasat-A oceanographic satellite to be launched by NASA in May 1978. NASA's Jet Propulsion Laboratory will operate the satellite for the Office of Applications' special projects division.

Headquarters for the coastal experiment group at the Scripps Institution of Oceanography at La Jolla, Calif., assigned five aircraft, two Navy radar stations, two instrumentation towers and assorted buoys to carry out the job. Measurements of Pacific Ocean waves, currents, winds and temperatures began Feb. 14 off the southern California coast. Surface monitors, some deployed as far as 128 kilometers (80 miles) offshore, included buoys and gauges emplaced beyond San Clemente and the Santa Catalina Islands.

The project's two main goals were: to check out aboard high-flying NASA planes sensing instruments planned for use on Seasat, and to involve researchers and prospective users of Seasat data in long-range cooperative air and surface studies.

Four NASA planes—a CV-990, C-130, U2 and P3—and a U.S. Coast Guard C-130 were used in the aerial reconnaissance. The first three operated out of northern California and performed most of the longer flights over the Pacific northwest and southern California. The other planes were used on shorter low-level flights out of San Diego and Ontario, Calif.

The four instruments tested included a synthetic aperture imaging radar, a wind-field scatterometer, scanning multi-frequency microwave radiometer and a radar altimeter. All are designed to measure ocean wave heights and directions, tides, surface temperatures and sea surface winds and directions. Omar H. Shemdin of JPL and D. L. Inman of Scripps are the principal investigators. James E. Blue of JPL is test director.

Seasat, which will make the first global-scale ocean observations from a near-polar orbit, will encircle the Earth 14 times a day at an altitude of 772 km (480 mi.). By contrast, the planes testing the instruments flew at altitudes up to 9,144 meters or 30,000 feet (the C-130), and 12,496 m or 41,000 ft. (the CV-1990).

The efficiency of the radar imaging system already has been demonstrated by a JPL-led study team in aerial measurements of the Arctic ice floes north of Alaska.

The recently completed project involved more than 100 scientists and technicians from: NASA's Ames Research Center, JPL, Goddard Space Flight Center, Johnson Space Center, Wallops Flight Center and Langley Research Center; the Navy Undersea Center, Naval Postgraduate School, Naval Research Laboratory; National Data Buoy Service, National Marine Fisheries Service, Pacific Marine Environmental Laboratory; Scripps Institution of Oceanography; Shell Oil Co.; Army Corps of Engineers and its Coastal Engineering Research Center; California Coastal Water Research Project; City University of New York; Louisiana State University; University of Florida and the California Institute of Technology.

Tracking the Travels of Sea Cows

Manatee tracking is not your everyday scientific activity, and "manatee" is hardly a household word. But Florida biologists are working hard to develop means of keeping tabs on the creatures' wanderings. The manatee, or sea cow—an aquatic relative of the elephant—is a large plant-eating mammal presently on the endangered species list. Its habitat often is Florida drainage canals, which are rich in water hyacinths, a favorite food of the animals.

NASA's Kennedy Space Center recently awarded a contract for $25,970 to the Georgia Tech Research Institute at the Georgia Institute of Technology (Atlanta) to develop a more satisfactory system for tracking manatees than the one used in an earlier experiment in 1975. The contract calls for Georgia Tech to develop a workable concept of an automatic tracking system that will enable researchers to determine the location and movements of manatees.

According to Blair Irvine of the U.S. Fish and Wildlife Laboratory in Gainesville, Fla., the 1975 tracking device was a sonar "pinger" attached just above the manatee's tail by a girdle. Irvine said the system was not completely satisfactory because the sonar range was limited and the signals given off were highly directional, making tracking difficult. He said that the new project will seek better ways to keep track of animals such as the manatee, to pinpoint their roaming patterns and living habits.

The total U.S. population of the Caribbean manatee—one of three varieties found in Atlantic waters—is estimated at 1,200 to 1,500 animals, all of them in Florida. Of that herd, perhaps 100 are concentrated in the waters of the Banana and Indian Rivers and Mosquito Lagoon near the Kennedy center. A large proportion, some 25 percent, of that population perished as a result of last winter's abnormally cold weather, Irvine said.

The connection between the NASA center and wildlife research is that 140,000 acres of land and water in the northern part of KSC long ago were designated as a wildlife refuge. NASA contributes to research and conservation programs conducted in the region by the U.S. Fish and Wildlife Service and the National Park Service.

Marine Mammal Takes a Ride—A half-ton female manatee is readied for a truck ride from the Kennedy Space Center to a sealife display center. The gentle creature raises no objection to handling by personnel of the U.S. Fish and Wildlife Service.

Aviation Advances Commemorated

Several nationally important anniversaries are being celebrated this year in the rural community of Mentone, Ind., where aviation pioneer Lawrence D. Bell (1894-1956) was born and raised. The town is building a museum to display Bell's priceless 44-year collection of aviation artifacts.

Historical events being commemorated are:

- The 20th anniversary of the first flight of the Bell G-14, which was the first vectored-thrust jet VTOL. Today designated the X-14B, the aircraft is still used in research programs for NASA at the

Ames Research Center. The first free-hovering flight of the X-14 took place on Feb. 19, 1957. Neil Armstrong, the first astronaut to walk on the Moon, flew the X-14A in a series of preliminary lunar landing studies.

- The 30th anniversary of the first supersonic airplane, the Bell X-1. Air Force Capt. Charles E. Yeager (now a retired brigadier general living in Cedar Ridge, Calif.), flew the X-1 faster than sound—breaking the myth of an impenetrable "sound barrier"—on Oct. 14, 1947.
- The 35th anniversary of the first flight of America's first jet airplane, the Bell P-59. Test pilot Robert M. Stanley (who now heads Stanley Aviation Corp., Denver, Colo.) flew the first P-59 flight on Oct. 2, 1942.

The original X-1 and P-59 aircraft today are on display in the Smithsonian Institution's National Air and Space Museum, Washington, D.C.

On July 23, in Dayton, Ohio, Lawrence D. Bell will be enshrined in the Aviation Hall of Fame. Named to the Aviation Hall of Fame at the same ceremony will be Walter Herschel Beech, James Smith McDonnell, Will Rogers and Alan Bartlett Shepard, Jr.

Three Historic Aircraft—Top photo is of the Bell X-14, first vectored-thrust VTOL; at center is the Bell X-1, first plane to fly faster than sound; at bottom is the Bell P-59, first American jet.

Birthday Celebration for the X-14—To mark the 20th anniversary of the first flight of the X-14 research aircraft, many "old acquaintances" of the first jet-propelled plane that was able to combine conventional flight with vertical takeoffs and landings gathered in celebration at the Ames Research Center. In "X" formations are (back "row" l. to r.): Frank Pauli, Seth Anderson, Dave Walton, Terry Fiestel; next row Dan Dugan, Jim Rogers, Ed Vernon, Lee Jones; next, Cy Sewell, Dick Greif, Lloyd Corliss; next, Ron Gerdes, Dick Gallant, Terry Stoeffler; next, Bill Carpenter, Sid Selan, Lonnie Phillips, Jim Kozloaski; front, Fred Drinkwater, Jim Meek and Vic Bravo (far right).

Bell was one of the nation's top aviation executives. He founded Bell Aircraft Corp. (today named Bell Aerospace Textron), Buffalo, N.Y., in 1935 and provided the leadership for it to become a world-renowned producer of advanced aerospace technology.

When Bell died in 1956, he left $20,000 to Mentone to build a library in honor of his parents, Isaac and Harriet Sarber Bell. He also left his aviation collection and for years it was kept in storage because Mentone, a community of about 800, had no suitable place for its display.

In 1976 Mentone organized a campaign to raise $200,000 to build the Lawrence D. Bell Aircraft Museum to house Bell's artifacts. The town is receiving nationwide support for the project.

The museum will cover 589 square meters (6,400 square feet) on a 1½ acre lot adjacent to the town park. It will contain countless objects—from small items, such as the tickets to the first air show Bell attended (1910) to models of Bell's aircraft, letters from kings and presidents, and the control wheel from the airplane in which Larry's brother, Grover, died in 1913.

Conservation Group Commends NASA Center

At its Executive Committee meeting of Jan. 29, 1977, the Florida Audubon Society voted for a resolution of commendation to NASA and the John F. Kennedy Space Center for their financial sponsorship of important scientific studies and monitoring of wildlife populations of selected key species.

The commendation read as follows:

"WHEREAS the National Aeronautics and Space Administration (NASA) at the John F. Kennedy Space Center includes natural ecosystems and wildlife of enormous value and integrity; and

"WHEREAS the wise maintenance and management of these ecosystems depends heavily upon ongoing scientific studies and monitoring of populations of selected key species:

"NOW THEREFORE BE IT RESOLVED that the Florida Audubon Society commends NASA for its financial sponsorship of such studies and monitoring, especially of the work of Dr. Llewelyn Ehrhart [Florida Tech] and his co-workers on the important sea turtle populations, and urges that NASA maintain such support in the future."

Viking Biology Instrument No Longer Functional

One of the three experiments in the biology instrument on Viking lander 1 has developed a leak that ends its operation on Mars.

The instrument's gas-exchange experiment, which looks for signs of respiration or breathing, apparently failed to seal tightly during its final cycle while analyzing soil from the bottom of a deep trench at the Chryse Planitia landing site.

The final gas-exchange experiment began April 3. After scientists at NASA's Jet Propulsion Laboratory first detected the problem in late April, they concluded that the experiment was inoperable.

Meanwhile a soil sample is being incubated in the biology labeled-release experiment aboard the lander 1. That experiment measures metabolism by the release of radioactive carbon from a simple nutrient supplied to the soil sample.

The biology labeled-release and gas-exchange instruments aboard Viking lander 2 continue to function and began final soil tests about April 21. The project is managed for NASA by the Langley Research Center. The spacecraft are controlled by NASA's JPL.

Astronaut Gibson Returns to NASA

Dr. Edward G. Gibson, science pilot on the 84-day Skylab 4 mission in 1973-74, recently rejoined the Johnson Space Center's Astronaut Office.

Gibson, 40, resigned from NASA in December 1974 to become a senior staff scientist at the Aerospace Corp., El Segundo, Calif. In 1976, he joined ERNO, Bremen, West Germany, the prime contractor for Spacelab, which is to be flown aboard the Space Shuttle.

Back at NASA, he was assigned to the mission specialist office, headed by Astronaut Joseph P. Kerwin. Gibson's degree is in engineering and physics.

Aircraft Simulation of Shuttle Missions Carried Out

NASA and the European Space Agency in late May completed a 10-day simulation at the Ames Research Center of a 1980's Spacelab mission, using the Galileo II for the experiment. The aircraft was packed with Spacelab-type hardware, experiments, and a mobile van which provided living quarters to permit isolation of a crew as on a space mission.

Called ASSESS II—for Airborne Science/Spacelab Experiment System Simulation—the mission began May 16 and was carried out by a mission specialist and four payload specialists (two from NASA and two from ESA) who were confined to the aircraft and van for 10 days.

ASSESS II tested techniques and models of operation to be used aboard Spacelab, the space laboratory being developed by ESA in cooperation with NASA.

Spacelab will be a major part of the Space Shuttle orbiter where the research personnel will eat and sleep. Because more experiments than research personnel will be aboard Spacelab flights, it will be necessary for each person to operate more than one experiment.

In addition to the effort to obtain basic scientific information, objectives of the recent simulation included evaluation of management of payload and mission operations to develop low-cost concepts for Spacelab, studies of interactions between experiment operators (payload specialists) in Spacelab and principal investigators on the ground, and development

of minimum training requirements to permit Spacelab participants to carry out their duties. Another objective is to evaluate a plan that includes uses of principal investigators as payload specialists.

Galileo II, NASA's "flying laboratory" made six-hour flights on each of the 10 days of the ASSESS II mission, carrying the payload and mission specialists who remained inside the craft working on the experiment payload and sleeping in adjacent living quarters.

Six simulated Spacelab missions have been completed since the program began in 1972, each designed to evaluate potential Shuttle-Spacelab concepts in increasing detail. ASSESS II is the second mission to use the Galileo II. The first such mission was conducted jointly with ESA in June 1975 and involved five data flights over a six-day confinement period.

ASSESS II is a joint effort by NASA and ESA. Five instrument packages were furnished by ESA and five by NASA. The experiments generally are in the fields of Earth resources, atmospheric pollution monitoring and infrared astronomy.

A prime objective of the operation is to involve the actual ESA and NASA Spacelab management elements in the same roles they will have during an actual Spacelab flight. On the NASA side, these elements include headquarters in Washington, D.C.; the Marshall Space Flight Center, which is managing the mission; the Johnson Space Center, in charge of flight operations; the Kennedy Space Center, to handle integration similar to the plans for Spacelab integration at Cape Canaveral; and the Ames Research Center, which operates NASA's Galileo II aircraft. Operations will include a mission control center and a payload operations control center under the management of the Johnson and Marshall centers respectively.

Astronaut Karl Henize of Johnson served as mission specialist for the simulation. His duties included controlling and monitoring aircraft (spacecraft) experiment support systems, coordinating activities of the payload specialists and providing interface between payload specialists and the Galileo flight crew. Another astronaut, Robert Parker, who was a member of the ASSESS I simulation team, served as backup mission specialist.

NASA and ESA each provided two payload specialists for the mission. Robert T. Menzies and David S. Billiu, both of NASA's Jet Propulsion Laboratory, were prime payload specialists. Menzies also was a principal investigator for one of the experiment packages. Leon B. Weaver of the Marshall center, was backup to both.

ESA's payload specialists were Claude Nicollier of Switzerland, Juergen Fein and Klaus Kramp of Germany, and Michael Taylor of England. Nicollier and Taylor worked on flight operations and Fein and Kramp served as ground backups.

The mission was completed May 26. On May 30, the aircraft was flown to Paris where it will be exhibited as it was configured for the ASSESS mission at the Paris Air Show. Following the air show, Galileo II will be flown to Cologne, Germany, where the ESA experiments will be removed.

Solar Energy Systems Gain Momentum

A far-reaching effort to develop practical and economical residential and commercial solar heating and cooling systems is into its third year at NASA's Marshall center.

The program, part of a five-year demonstration project assigned to the Energy Research and Development Administration by Congress in 1974, is designed to develop cost-competitive, reliable solar heating and cooling systems and subsystems leading to mass production and marketing by industry.

In managing the concentrated development effort for ERDA, MSFC is making maximum use of established techniques reached through past research and development completed at Marshall, other NASA centers, ERDA, the National Science Foundation, by industry and by other scientific and academic communities.

The development portion of the program, under Marshall management, is meant to attract participation by pioneer and small companies, as well as large businesses in the heating and cooling industry. Maximum participation by small business in the program has been sought through widespread release of requests for proposals.

More than $27 million has been awarded, or is in the process of being awarded, for 37 contracts in Marshall's development program. Eleven of these involve large businesses; 26 have gone to small businesses. In addition, ERDA has awarded 32 contracts valued at about $10 million in its commercial demonstration program. Those also are being managed by the Marshall center.

In each of the commercial demonstration sites, the contractor purchases or builds his own solar system and erects it on his building. The systems may be for hot water, heat or cooling, or any combination of the three. The contracts are cost-sharing, with the government contributing $7.9 million and the contractors picking up the tab for more than $2 million.

Contractor News

The Bionetics Corp. of Hampton, Va., received an $869,727 contract extension from the Kennedy Space Center for continuation of reference standards services and calibration of instruments in support of operations. The cost-plus-fixed-fee extension for the period from May 1, 1977 through April 30, 1978, brings the total value since the contract began to $1,479,731.

The Bryson Construction Co. of Decatur, Ala., recently won a $276,597 contract for modifications to the Redstone Arsenal Airfield in preparation for the arrival at the Marshall Space Flight Center of the Space Shuttle orbiter. The *Enterprise* is due to arrive at the Marshall center in March 1978.

The H&H Construction Co. of Lancaster, Calif., was awarded a $166,000 small business contract by the Dryden Flight Research Center. The company will provide contractual services for an aircraft parking ramp, to include labor, materials, transportation, plant and equipment. The ramp will be used by Space Shuttle pilots to park their T-38 aircraft when they fly in the approach and landing tests.

The T. H. Taylor Construction Co. of Montgomery, Ala. is under contract to the Marshall center for modification of a test stand to be used in the Space Shuttle program. The $918,523 contract calls for constructing permanent and semi-permanent steel working platforms at various levels of the test stand that was used in the 1960s during Saturn V development.

Rockwell International Corp., Space Division at Downey, Calif. was awarded a $95,025,000 contract by the Kennedy Space Center. The contract is for a three-year period and provides for Rockwell participation in activities of Space Shuttle facilities and systems, and for orbiter support during checkout, launch and post-flight operations for the first six Space Shuttle missions. The contract also calls for Rockwell to support orbiter post-flight operations at NASA's Dryden center following landings there. The orbiter will land at the Dryden center following each of the first four missions.

Grumman Aerospace Corp. has been awarded a $478,375 contract to improve clothing and equipment for firefighters as a part of a project called FIRES—for fire-fighters integrated response equipment subsystem. The program is administered jointly by the Marshall center and the U.S. Department of Commerce National Fire Protection and Control Administration.

NASA has awarded two $350,000 contracts to two industry teams—one at the **McDonnell Douglas Corp.** of St. Louis, Mo., the other the **Hughes Aircraft Co.** at El Segundo, Calif. and the **General Electric Co.** at Philadelphia. The parallel contracts are for design studies of an entry vehicle that would reach Jupiter in late November 1984 and make detailed measurements of the giant planet's atmosphere and clouds. The atmospheric entry vehicle will be the probe component of NASA's planned Jupiter orbiter with probe mission, requested as a new start in the space agency's budget for fiscal 1978. ■■■

Planning for Better Firefighting Equipment—The Project FIRES development contract—in which space age technology and techniques are applied to the development of lighter, tougher and safer equipment for U.S. firefighters—is signed at the Marshall center. Seated, left to right, are: Richard G. Smith, deputy director of the Marshall center; Hy Kaplan, Grumman Aerospace Corp.; and Andy Sears of the National Fire Protection and Control Administration. Standing are (l. to r.): Ismail Akgay, project manager, MSFC technology utilization office; and John Levinsin, project engineer of MSFC's systems analysis and integration laboratory.

Asimov Addresses Langley Audience

Dr. Isaac Asimov was the guest speaker last month for the Langley Research Center colloquium and public lecture series, "Our Future in the Cosmos." Asimov addressed the topic "The Moon as Threshhold" before Langley employees and the general public. The public lecture is co-sponsored by NASA and the College of William and Mary.

Asimov proved to be an exuberant lecturer who held his Langley audience spellbound as he described the progress of Earth's inhabitants from the Moon to outer space.

A Prelude to Living in Space (part 2)

In the previous isssue of Activities, *the Ames Research Center's project that resulted in the selection of 10 women volunteers to undertake rigorous tests related to human reactions to space travel and return was described. The tests are completed now, to be followed by experiments on 45 to 55 year-olds. This, the second installment, describes what happens after the bed-rest period has begun.*

From the outset, the physician managers describe in frank terms what will happen to participants:

"The centrifuge test consists of six rides on a wheel similar to an amusement park thrill ride, but at different speeds. You will feel a force pushing you down into the chair. To be sure no harm occurs to you, a medical monitor (an M.D.) will be watching you on a TV screen and talking to you during the run.

"Your pulse rate and blood pressure will be taken frequently to check your safety and to tell us how your body is reacting. As you sit tilted back in a chair (during the bed rest phase you will be lying flat for this test), you will be looking at a row of small lights above you. You will be asked to respond many times to these lights by pushing a two-button switch in your hand to turn off the lights immediately after they have been turned on. At the highest level of speed—when gravity is being exerted against your body at about three times the normal rate—you may faint or feel like fainting. The force pushing you into your seat is also pulling blood from your head into other parts of your body and if too much blood leaves your head, you may faint. Preceding this state, the lights will start to look dim or 'fuzzy.' We call this condition 'greyout.' The medical monitor will have two ways of knowing about your condition at this point: first, he will notice that you are slowing down as you turn off the lights; second, he will see, through a sensing device, a decrease in the flow of blood to your head. He may stop the test at this point; you may also stop it, any time, by pushing the second button on the switch you are holding.

"During or after a centrifuge run, you may get a slight headache, possibly feel sick to your stomach, feel tired, have leg aches, may get dizzy and may faint.

"Some of you—all those in the 55- to 65-year groups—will wear an anti-gravity suit during the rides. This is a specially made pilot's suit with a built-in system of air bladders that puts pressure on belly and legs to prevent or stop blood from collecting there under the increasing pull of gravity. It will feel as though you are wearing elastic stockings when the suit inflates. Some of you will be evaluating these suits to see how well they protect you from greyout."

The lower body negative pressure test, the medics explain, involves enclosing the lower part of the body (waist down) in a box that can develop suction. The negative pressure—that inside the box—is lowered for 15 minutes. Pre-test and post-test observations take five minutes each. The test allows for a measureument of the amount of blood that is drawn into the legs. As blood moves, with pressure, from the upper part of the body into the legs, the size of the legs increases slightly. These changes are detected by small surface electrodes attached to those areas which change their electrical resistance as volume shifts take place. During the test, a doctor stands by taking pulse rate and blood pressure once a minute to guard against the slightest sign of adverse effects.

The test also measures the size of the heart and how fast it squeezes blood into extremities through use of a sensor affixed to the chest, which radiates sound waves into the body.

Additional warnings about exactly what to expect are contained in Dr. Sandler's statement: "You may feel lightheaded or dizzy and as if you are going to faint. Sometimes, rarely, you faint before you experience a warning. Should you begin to feel dizzy or faint, you have a switch in your hand that stops the test."

Flying while Grounded—Nance Lou Deardorff, one of the ten volunteers in the month-long Ames program to assess the effects of space trips on the human anatomy, "flies" a small flight simulator twice a day from a supine position. The test is to measure performance levels as the effects of total bedrest intensify.

Subjects are told that during bed rest, numerous blood samples will be taken, deep body temperatures and electrocardiograms will be recorded continuously to determine the effects of bed rest on the rhythms of each individual and even their sleep patterns will be recorded.

The circumstances and rules of the bed rest phase also are spelled out for each volunteer. The primary requirement is total and absolute bed rest, flat on one's back, all bodily functions performed from that position. A standard sized pillow is used. (Nurse O'Hara warns: "No scrunching allowed.")

About the only variation on the flat-on-back edict is that a subject can prop up his/her head slightly to eat. Even showers are taken in a horizontal position in a specially developed facility into which the subject is moved via a wheeled gurney—somewhat like sliding a cake into an oven. Nozzles along the sides of the stall provide water, which flows horizontally. Reading in bed is accomplished through use of what is called the "able table," a device that holds a book above and in front of a patient, with movable straps holding pages flat.

No visitors are allowed though outgoing telephone calls may be made via a phone placed about four feet above the floor so that callers need not strain to reach it. Continual wearing is required of a "Biobelt" around the waist, which contains the antennas that will send various kinds of data to recorders in another room at the facility. No smoking, no alcoholic beverages, no candy or snacks, no drugs or medication unless prescribed by the attending physician, no dieting—subjects are expected to eat three normal meals a day—lights off at 11 p.m., on at 7 a.m. Ten centrifuge rides and four lower body negative tests administered during bed rest, and the test "flights" of the simulator (placed above a subject's bed) are for the purpose of measuring reflexes and coordination.

Earlier studies at the Johnson Space Center demonstrated a significantly decreased tolerance (greyout) to higher-than-normal rates of gravity after bed rest simulations of weightlessness.

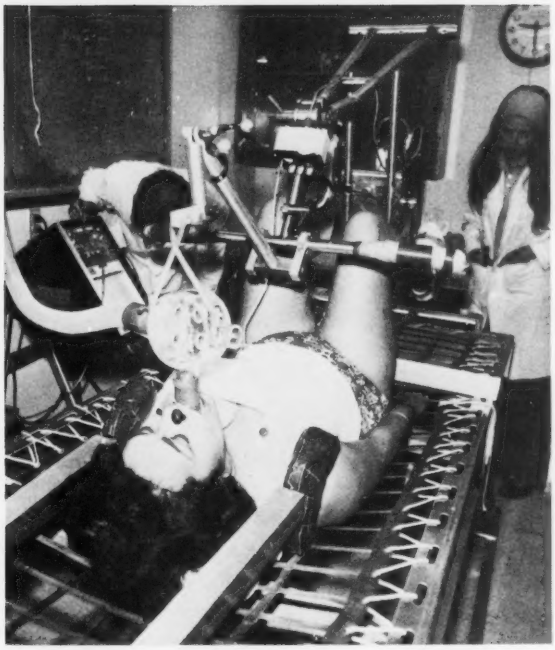
The circumstances surrounding the medical experiments are not all gloom and doom, however. The Ames facility is a pleasant, modern laboratory painted in cheerful coral and yellow with colorful wall decorations. Many books and games are on the shelves and each of the beds (two to a soundproofed room with dividers between beds) is equipped with stereo and color television.

The residential area contains a lounge, recreation and dining areas, a kitchen, several bathrooms and a nurse's station with phone communication to each bed. Beds are changed daily, the food is well prepared, nourishing and attractively served. Nurse Dee O'Hara's long experience in similar medical situations causes her to be particularly sensitive to the hardships of long confinement in relatively small quarters, so she strives for cheerful upbeat surroundings. Even the jumpsuits provided for the women while they are ambulatory are fashioned from colorful fabrics, each one a bit different from the next—unlike the drab green or wrinkled whites so often seen in medical circles.

Medical attendants, consisting of doctors, nurses and technicians, are on hand at all times and remote monitoring of physiological functions constantly provides recorded data about each of the subjects at an electronic center. All these factors combine to reassure the volunteers and to make them feel safe and comfortable. And they know that should they choose to withdraw from participation, they may do so at any time.

A six-day recovery period follows completion of the bed rest period. The volunteers are given one more lower body negative pressure test, and additional blood tests along with a complete physical examination before discharge.

Daily Quiz—Christine Smith concentrates on giving correct answers during a memory test administered each day during the Ames medical study of the effects of weightlessness. The test is one of several ways in which reactions to prolonged bedrest are measured.



Responses Tested in "Weightless" Simulation. As Charlene Johnson pedals a horizontal bicycle in an exercise test at the Ames center, her physical reactions are measured.

Astronaut Evans to Private Industry

Astronaut Ronald E. Evans left NASA March 15, to become a coal industry executive. The command module pilot of Apollo 17 in 1972, Evans was named executive vice president of Western America Energy Corp. and Director of Marketing for WES-PAC Energy, the coal-producing concern of WAEC. Headquarters is in Scottsdale, Ariz., where the Evans family will reside.

"I really appreciate the opportunity I've had to participate in this nation's space program, and I'd like to thank everyone involved for their help to me and in making the program a success," he said.

Evans, 53, was selected as a NASA astronaut in 1966. He logged 301 hours and 51 minutes in space during the Apollo 17 mission to the moon, including a one-hour, six-minute "space walk." He was a member of the astronaut support crews for Apollos 7 and 11 and was backup command module pilot for the Apollo 14 and the Apollo Soyuz Test Project.

He retired from the Navy as a captain in May 1976 but remained in the astronaut corps where he has been responsible for the operational aspects of the ascent phase of the Space Shuttle orbital flight tests scheduled to begin in 1979.

New Employee Group at Kennedy Center

An Employee Motivation Staff has been created at KSC to promote voluntary participation and incentive programs for employees. Headed by Tom Griffin, former KSC aerospace awareness coordinator, the new office is a staff function reporting to the director of administration and management operations. Sara Sheppard serves as awards specialist, and Carolyn Merica as awards clerk.

The purpose of the new office is to provide management guidance and continuity for participation programs and to motivate civil service and contractor personnel to participate in incentive programs.

The staff has total program responsibility for the awareness program, the suggestion program, the cost reduction program at KSC, and the NASA and KSC honorary and non-NASA honorary awards. It will provide assistance and continuity for other participation programs such as scientific and technical contributions, technology utilization, patents, low cost systems, energy conservation reduction and equivalent contractor programs.

Sailboat Voyagers Tracked by Satellite

The value of satellites to search and rescue missions for small craft at sea recently was demonstrated by a retired engineer and a Florida family of three which sailed a 10-meter (33-foot) sailboat 965 kilometers (600 miles) over the Bahama Banks, between Miami and the Exuma Islands in the eastern Bahamas. (The area is in what is often called the "Bermuda Triangle.")

During the 30-day trip, a satellite provided details about the general location and condition of the voyagers to engineers at NASA's Goddard Space Flight Center.

Small or medium-sized craft venturing into the open sea usually must rely on marine radio telephone communications and most such systems are limited to about 40 kilometers (25 miles) line-of-sight range. Other longer-range, voice-radio equipment is subject to static and often is unreliable.

The principal experimenter for the satellite search and rescue test was James L. Baker, a retired NASA engineer from Sherwood Forest, Md. He conducted the extensive tests aboard the sloop "Sirius." Owner Louis Van Houten of Key Biscayne, Fla., piloted the craft with the aid of his wife Roz and son Peter.

NASA's Nimbus-6 meteorological research satellite kept tabs on the four voyagers by monitoring continuous signals from a small transmitter on the

sailboat. This battery-powered unit, normally carried by meteorological balloons, automatically sends out a signal once-a-minute for relay to Goddard via the satellite.

Within one hour after the data was received at Goddard, a computerized system printed out information on the boat's position. About 40 percent of the positions, as derived from the satellite data, were within one mile of the true positions. The overall accuracy of the derived positions was within three miles.

From its earth polar orbit, the Nimbus-6 was able to track the sailboat for about 3½ hours around local noon and another similar period of time around local midnight each day.

As part of the test, Baker evaluated a pushbutton distress alarm system which was connected to the onboard transmitter. Simulated distress messages, craft identification, and weather and cruising conditions thus were relayed successfully by satellite to Goddard.

The pushbutton unit, developed by Baker under contract to Goddard, is designed to repeat its distress message automatically, once energized. Crew members confronted with a genuine emergency could therefore initiate the distress message and then turn their attention to coping with the emergency.

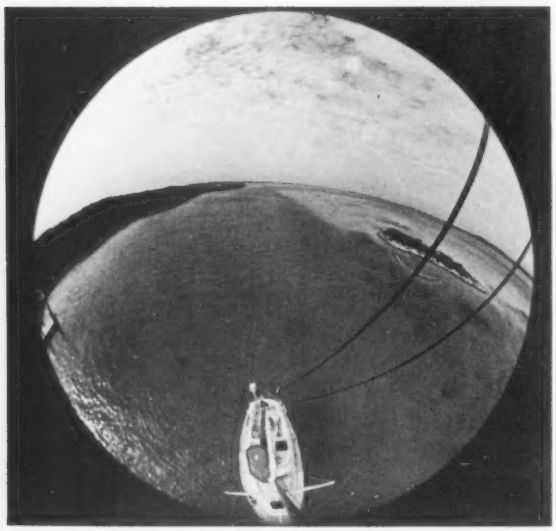
The compact and lightweight nature of the transmitter and its components makes possible its quick and easy transfer to a lifeboat if necessary.

Baker coordinated the experiment with Goddard through NASA's Applications Technology Satellite-1. Still in use after more than 10 years in orbit, the ATS-1 is positioned in a stationary orbit some 35,680 kilometers (22,300 miles) above the equator south of Hawaii. From there, the satellite commands a view extending from Japan to the Atlantic waters off the U.S. east coast.

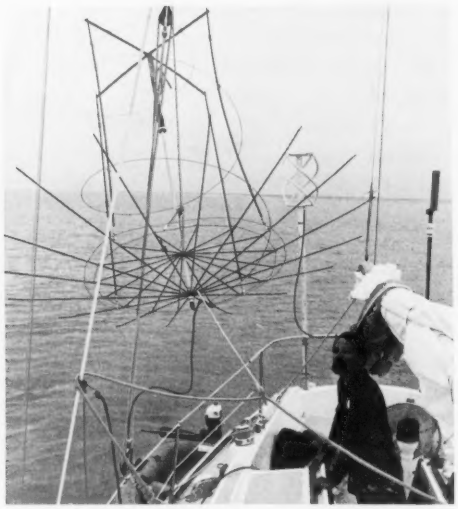
For the ship-to-shore communications, Baker used a commercial 20-watt transceiver modified to operate on satellite frequencies. The shipboard antenna was a small and rugged unit designed especially for mobile application.

While south of Nassau (in the mid-Bahamas), Baker established contact with Japan's Kashima ground station through the ATS-1. This test of the system proved to be the longest communications distance ever covered from a sailboat using a single satellite for relay.

"It was a comfortable feeling for us to know that Goddard had up-to-date information on our position and cruising conditions, particularly since we were in the notorious 'Bermuda Triangle' where many craft have disappeared," said Baker after the voyage.

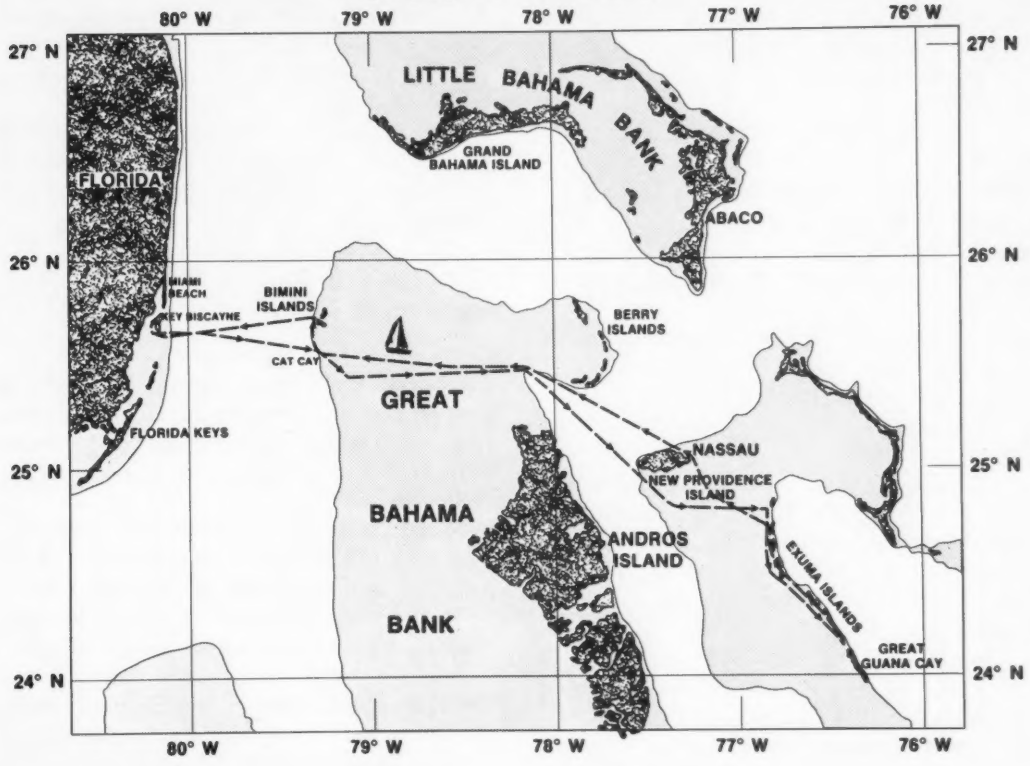


Fisheye View—The *Sirius* in a photo taken from atop her mast as the sailboat cruised between Key Biscayne and Nassau for satellite search and rescue tests. Satellite tracking and communications antennas can be seen projecting from the stern of the sailboat.



Sailing by Satellite—Owner Louis Van Houten is shown aboard his sailboat during a 30-day trek into the Bermuda Triangle area off Florida to evaluate the use of satellites for search and rescue of small craft at sea. The sailboat covered 965 kilometers (600 miles) during the test. To Houten's left is a variety of antennas used to coordinate the test via satellite with NASA's Goddard Space Flight Center.

Satellite Aided Search And Rescue At Sea
(Voyage Of The Sirius)



Fellowship Established at Stanford for Space Pioneer Allen

Friends and associates of the late H. Julian Allen (his death was reported in the April *Activities*) have established the H. Julian Allen Memorial Fellowship Fund at Stanford University to support graduate fellowships in aeronautics and astronautics. Creativity is to be a major factor in selection of fellows. Financial contributions are sought.

"Harvey" Allen, well-known former director of NASA's Ames Research Center, did the work that made possible atmospheric entry and safe return of the Apollo astronauts to Earth.

Those wishing to contribute to the Allen Fellowship Fund should call Mrs. Esther Levy, 415/965-5091, at Ames, or Dean William Kays, 415/497-3935, at Stanford.

Miles Ross Resigns

Kennedy Space Center director Lee R. Scherer recently announced the resignation of his deputy director, Miles Ross. Ross has accepted the position of regional manager in Europe for TRW Systems International, Inc. He assumed his new duties in early May at Brussels, Belgium.

Scherer accepted the resignation with deep regret, noting that "Mike has been a very strong deputy. He has played a vital role in the development of KSC since joining NASA in 1967. His knowledge and background and his good judgment have been invaluable to me in the management of the center."

Ross was with TRW for 11 years before he joined NASA. He was project manager of the Air Force Thor and Minuteman missile systems for TRW's Florida operations. He became KSC's deputy director in 1970.

NASA Symposium '77 Held at JSC

More than 1,800 students from Texas junior and senior high schools gathered at the Johnson Space Center in March to participate in "NASA Symposium '77."

A first-of-its-kind event at a NASA center, the symposium was designed to motivate youth—particularly female and minority students—to seek engineering and science careers.

Some 600 students and counselors from school districts in 17 Texas cities attended each day of the event.

Johnson center and contractor employees conducted workshops and discussed their own careers as scientists or engineers. Participants also toured various work areas.

"We hope the use of center employees as 'role models' will serve as an effective motivating factor for the students," said Joseph Atkinson, chief of the Equal Employment Opportunity Office at the center.

Themes for the symposium included: Space Research Activities—Past, Present, Future; Space Technology—Its Practical Applications and Benefits; NASA's Research and Development Program; Motivating Minorities and Women Into Science and Engineering Careers; and Future Careers in Science, Engineering and Technology.

Youths Try Out Space Mechanism—At the Johnson center, student visitors are shown how to operate one of the consoles used to track satellites in space.

Administrators from colleges and universities which enroll high percentages of minority and female students attended a seminar during the symposium concerning NASA's research, training and employment opportunities. The information they received will be passed on to their students.

Awards were presented to students who submitted outstanding science papers before the symposium. The papers were judged by professional scientists and engineers.

Chesapeake Bay as Seen by Spacecraft Images

The value of the "big picture"—how the entire Chesapeake Bay looks through the "eyes" of NASA's Landsat satellite—was the subject of a conference on how remote sensing techniques may help solve some of the ecological problems of the Chesapeake Bay region.

Each Landsat image covers 34,252 square kilometers (13,255 square miles), an area which covers the bay region from the Maryland-Delaware border in the north to the Maryland and Virginia shores 185 km (115 mi.) to the south.

Sponsored by the University of Maryland in conjunction with NASA and the Environmental Protection Agency, the conference was held April 12-15 in Berkeley Springs, W. Va.

More than 80 people attended the conference, representing state and regional planning agencies, regulatory agencies, universities and private industry concerned with the health of the bay. Attention was focused on the use of satellite, aircraft and other remote sensing techniques as solutions to many of the problems associated with land use, resources and pollution.

The opening address was given by U.S. Senator Charles McC. Mathias, Jr., of Maryland, a long-time advocate of coordinated management of the bay. He has called for the establishment of a Chesapeake Bay Commission to oversee the many organizations studying bay ecology.

"The Chesapeake Bay, our nation's largest estuary, could become a dead sea within our lifetime unless we coordinate its stewardship," said Senator Mathias.

A second keynote address was delivered by Daniel J. Snyder, III, EPA Regional Administrator for the East Coast states bordering the Chesapeake Bay. EPA has announced a three-to five-year program devoted to studying and preserving the bay. Originally proposed by Senator Mathias, the wide-ranging program is slated for an annual budget of $5 million.

The size of the Chesapeake Bay—311 km (193 mi.) long—and the conflicting jurisdictions which have control over it make any monitoring program difficult. Remote sensing through the use of satellites and aircraft makes it possible to view the bay as a unified ecological system.

The two Landsat spacecraft in orbit and the third, scheduled for launch in early 1978, are all part of a major research program conducted by NASA to demonstrate the feasibility of applying remote sensing from space for the management of Earth resources.

Spacelab Investigators Meet at Marshall Center

The first meeting of investigators for the initial Spacelab mission brought together scientists from the United States, Europe, Canada, Japan and India. It was held April 13-15 at NASA's Marshall Space Flight Center. The group was chosen by NASA and the European Space Agency in February from candidates who responded to invitations to participate in the jointly planned NASA/ESA mission.

Marshall is the lead NASA center for Spacelab development and also has been assigned responsibility for the payloads of the first three Spacelab missions.

Sponsored by Marshall's spacelab payload project office, the meeting was organized to brief the investigators on the first Spacelab Mission management and engineering requirements; to allow them to learn about the other investigators' experiments; and to organize the investigators into the Investigators Working Group and discuss their future activities.

The IWG is chaired by the mission scientist, Dr. C. R. Chappell, of Marshall's space sciences laboratory. Group vice-chairman is Dr. Bernt Feuerbacher, the ESA project scientist.

The group will provide the investigators with a mechanism for full and direct visibility into the development and management of the mission, a direct channel for making recommendations to mission management and a method for selecting payload specialists.

The European-built Spacelab, designed to allow workers to live and perform experiments in space economically and frequently, is scheduled to be launched into Earth orbit aboard NASA's Space Shuttle for the first time in the second half of 1980. The primary objective of the first flight will be to verify the performance of Spacelab systems and subsystems, and to measure the environment surrounding the Shuttle.

The secondary objective will be to obtain valuable scientific, applications and technology data and to demonstrate the broad capability of Spacelab to perform space research. Stratospheric and upper atmosphere research will be emphasized on this flight, but experiments will be performed in plasma physics, biology, botany, medicine, astronomy, solar physics and Earth observations and in technology areas such as thermodynamics, materials processing and lubrication.

The Spacelab configuration for the first flight will consist of a pressurized module and a pallet. The pressurized module is the laboratory in which the payload specialists will work. It will have a shirtsleeve environment to make work as pleasant and as nearly like that of an Earth-based laboratory as possible. For instruments that require exposure to space, Spacelab provides a series of pallet segments in the payload bay. In addition to serving as a mounting platform, pallets provide power, thermal conditioning, data and other services to the instruments. Spacelab 1 will have one pallet, but as many as five may be flown at one time.

Spacelab 1 will be launched by the Kennedy Space Center from the Eastern Test Range, Cape Canaveral, Fla., and will remain in the Shuttle Orbiter's cargo bay as it orbits the Earth at an altitude of about 250 kilometers (155 miles), with an inclination of 57 degrees. The flight will last one week.

After the Shuttle Orbiter reaches its proper orbit, Spacelab systems will be turned on and tested. Then the payload specialists, working with the orbiter crew and the scientific and technical investigators on the ground, will perform various experiments until the

Major Meeting at Marshall—At the first meeting of Spacelab principal investigators, four members answer questions during a press conference. Left to right are Dr. Bernt Feuerbacher, Spacelab project scientist (ESA); Prof. Georges Courtes, principal investigator and director of Laboratoire d'Astronomic Spatiale at Marseilles; Prof. R. von Baumgarten, principal investigator of the University of Mainz (Germany); and Dr. Rick Chappell, Spacelab-1 mission scientist at Marshall.

Spacelab systems are shut down in preparation for returning to the landing site. The two payload specialists, an American and a European, will work complementary shifts so the scientific experimentation can continue 24 hours a day.

The solar terrestrial division in NASA's Office of Space Science has overall management responsibility for the NASA Spacelab-1 payload. B. G. Noblitt is the program manager and Dr. W. W. L. Taylor is the program scientist. The Marshall center has project management responsibility for Spacelab with Robert E. Pace, Jr., as mission manager. Responsibility for the ESA payload is with its Office of Spacelab Payload Integration and Coordination in Europe at Porz-Wahn, West Germany.

Ames Research Center Takes Lead in Helicopter Research

NASA recently began implementation of its plan to establish the Ames Research Center as lead center for helicopter research. Approved last summer, the plan resulted from a NASA assessment of its overall research activities to identify areas where realignment would not only reduce costs but increase the effectiveness in view of growing competition from foreign industry in the helicopter field. Both the Langley Research Center and the Lewis Research Center will have responsibilties for key segments of the helicopter program.

Ames will conduct helicopter research on small-scale and large-scale hardware using aeronautical facilities, including its 40-by-80-foot wind tunnel and flight simulation capabilities, and will conduct flight tests with research rotorcraft such as the Tilt Rotor Research Aircraft and Rotor Systems Research Aircraft.

The emphasis at Langley will be on helicopter structures and some disciplinary research in acoustics, airfoils, aeroelasticity, and avionics components.

The Lewis effort will center on helicopter propulsion with the first step a proposed new program in helicopter transmission technology. This program will include helicopter engine technology in a later phase.

A NASA headquarters helicopter program office will be responsible for formulation of the overall agency helicopter program and integration of the research efforts of Ames, Langley and Lewis.

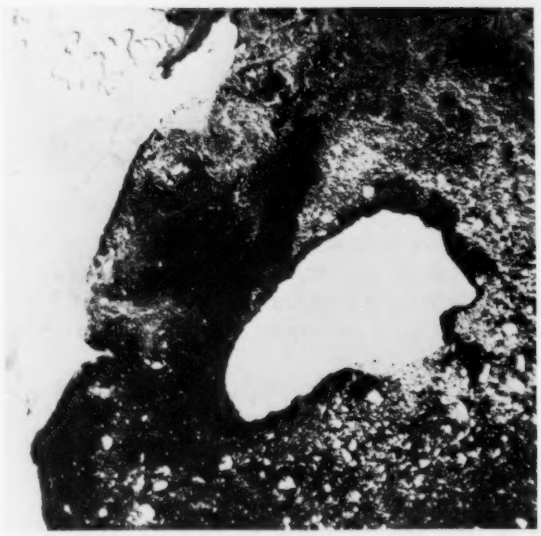
During the next three years these changes will result in the addition of 72 positions at Ames. During the period of transfer, the Langley activity in helicopters will be phased down but will continue at a level of 72 man-years engaged in continuing helicopter work.

Giant Iceberg under Spacecraft Surveillance

A gigantic iceberg about the size of the state of Rhode Island is being tracked by satellite during its 2,900-kilometer (1,800-mile) journey along the Antarctic coast toward the open sea east of South America. The phenomenon has been observed for some six years by NASA's Nimbus-5 and the two Landsats, as well as by the National Oceanic and Atmospheric Administration's weather satellites.

In mid-April, the iceberg—one of the largest ever seen—appeared to be grounded temporarily near the tip of the Palmer Peninsula. Observers expect a slow drift out of Antarctic waters toward South America and into the South Atlantic, then a slow disintegration in warmer waters.

Working closely with NASA's Goddard Space Flight Center, Navy weathermen have been tracking the berg since 1971 when it broke off from the Antarctica coast. They report that it is 74 km (46 mi.) long, 40 km (25 mi.) wide, 230-345 meters (750-1,000 feet) thick and contains enough fresh water theoretically to supply a city such as Washington, D.C. for 5,000 to 7,000 years. Or, if by some magic it could be towed to California, it would supply the state with



Tracking an Iceberg—A huge iceberg (in mid-picture) as seen from NASA's Landsat from an altitude of 920 kilometers or 570 miles. When photo was taken, it was temporarily grounded near the Palmer Peninsula, Antarctica.

enough water to last 1,100 years. (Although the idea of towing icebergs for use in arid regions of the Earth has been considered, no practical economical way of accomplishing that feat has ever been devised.)

Unbroken, the iceberg is too large to represent a serious danger to navigation, but as it moves into open water and breaks into smaller chunks, it could pose a threat to shipping. It is necessary, therefore that the smaller pieces be closely monitored via satellite by U.S. Navy Fleet Weather Facility forecasters in Suitland, Md. That facility has the responsibility for weather forecasting and ice-field routings in the polar regions for the Department of Defense and other agencies.

Navy Lt. Cdr. Tom Nelson of the Navy facility says that although the iceberg was first identified on polar orbiting weather satellite pictures in 1971, an examination of earlier pictures confirmed its existence as early as March 1967. He said an ice tongue extending out from the Princess Martha coast of Antarctica (still shown on some maps, but no longer there) was broken off the ice shelf either by winds or by collision with another large iceberg and thus began its 2,900-km (1,800-mi.) journey along the coast. In August 1975, the berg rammed into the Larsen ice shelf, breaking off another huge iceberg nearly 22 by 58 km (13 by 36 mi.), which is presently grounded near James Ross Island in Antarctica.

Satellite data are used to route ships through the treacherous polar ice fields. Acquired information is used to designate safe routes for icebreakers or other structurally reinforced ships that can make their way through weak ice. In pre-satellite days, it was necessary that ships travel over longer and less dangerous open-water routes.

Savings in manpower, material and money have been substantial, according to Nelson. He said that analyses of satellite data is routinely transmitted to U.S. and foreign shipping interests. During the past winter, some 14 ships relied on the satellite data. Of these, five were from the United States, consisting of two Navy icebreakers, a tanker, a cargo vessel and a National Science Foundation scientific vessel.

New Chief for Space Processing

On April 18, Dr. John R. Carruthers was named director of the office of materials processing in space, a new division established within NASA's Office of Applications.

Carruthers comes to NASA from the Bell Laboratories at Murray Hill, N.J. There he headed the crystal growth and glass research department from its inception in 1975. At Bell Labs, his primary responsibility was the development of optical fibers for light wave communications.

A native of Toronto, Carruthers received his B.S. degree in metallurgical engineering in 1959 from the University of Toronto, his M.S. degree in metallurgical engineering from Lehigh University in Bethlehem, Pa. while working for the Bell Labs. He returned to the University of Toronto in 1963 to win a Ph.D. in materials science in 1966. A year later he returned to Bell.

Carruthers is a member of Sigma Xi, the American Physical Society and the American Association for Crystal Growth. He was Chairman of the 1973 Gordon Conference on Crystal Growth. He serves on the Executive Committee of the American Association for Crystal Growth, and the Electronic Materials Committee of the American Institute of Mining, Metallurgical and Petroleum Engineers. He has served on NASA's *ad hoc* Advisory Space Processing Subcommittee since 1974.

Congressman Tours NASA Center—Senator S. I. Hayakawa of California (center) was a recent visitor to the Antelope Valley. While there, he toured the Dryden Flight Research Center and was given a briefing on Shuttle activities by Center Director Dave Scott (left) and Approach and Landing Test Program Manager Deke Slayton.

Did You Know?

NASA tour volume at the Kennedy Space Center in March was 114,845, raising total patronage for the first three months of 1977 to 283,734. March volume, highest of any 1977 month, was 2.8 percent below the March 1976 level.

A four-page history of the development and use of the Scout launch vehicle—from 1963 to the present—recently was published in the February 1977 publication *Quality Progress*. The title is "Scout Reliability—Maturity through Adversity." Copies of the article, which is copyrighted by the American Society for Quality Control, Inc. can be obtained from NASA's Langley Research Center, M/S 158-A, Hampton, Va. 23665.

For the first time, a woman commentator describes launch activities from beginning to end. She is Trudy Tiedemann of the Dryden Flight Research Center. A public information specialist at the center for several years, Tiedemenn began this new phase of her career when the Space Shuttle approach and landing tests began at the Dryden center last February. Now she is a regular fixture in the control room along with the flight test engineers conducting the tests.

A highly useful book, entitled "Origins of NASA Names" has been produced by the NASA History Office, under the direction Monte D. Wright. The authors are Helen T. Wells, Susan H. Whiteley and Carrie E. Karegeannes. All three are editors in the history office. The 227-page volume with pictures, contains numerous details concerning all launch vehicles, satellites, space probes, manned space flights, sounding rockets and NASA installations. It also carries four appendices that deal with: abbreviations, acronyms and terms; international designation of spacecraft; major launch record, 1958-1974; and NASA naming committees. The book sells for $3.65 through the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C., 20402. Its stock number is 033-000-00636-5. ■ ■ ■

Patents for Inventions from NASA Research

The Office of General Counsel, NASA Headquarters, announces that the following U.S. patents have been issued by the U.S. Patent Office to NASA for inventions resulting from NASA research. Inquiries concerning them should be directed to the attention of the NASA Patent Counsel of the indicated installation.

Inventor(s) and Employer(s)	Title & NASA Docket	Patent No.	Installation
William C. Stange, NASA/GSFC	Cyclical bi-directional rotary actuator	4,010,455	GSFC
Lott W. Brantley, NASA/MSFC; Billy D. Lawson, NASA/MSFC	Mount for continuously orienting a collector dish in a system adapted to perform both diurnal and seasonal solar tracking	4,011,854	MSFC
Kenneth R. Lorell, NASA/ARC; James P. Murphy, NASA/ARC	All sky pointing attitude control system	4,012,018	ARC
Harry V. Fuller, NASA/LRC	Binocular device for displaying numerical information in field of view	4,012,123	LARC
Bruce A. Banks, NASA/LRC	Anode for ion thruster	4,011,719	LERC
Fred R. Lemos, NASA/ARC	Metallic hot wire anemometer	4,011,756	LERC
John D. Whittenberger, NASA/LRC	Zirconium modified nickel-copper alloy	4,012,237	LERC
James R. Lesh, Stanley A. Butman, Caltech/JPL, Pasadena, Calif.	Multiple rate digital command detection system with range clean-up capability	4,012,696	NRLO
Emmett W. Chappelle, GSFC/NASA; Grace L. Picciolo, NASA/GSFC; Michael J. Barza, Louis Weinstein, Stephanie A. Tuttle, Hillar Vellend, New England Medical Center, Boston, Mass	Application of luciferase assay for ATP to antimicrobial drug susceptibility	4,014,745	GSFC

NASA Pilot Commands Navy Squadron

Byron E. Batthauer, a research pilot at NASA's Lewis Research Center and Captain in the Naval Air Reserves, recently was appointed commanding officer of Fleet Logistics Squadron 52—the largest transport reserve squadron in the U.S. Navy. The Strongsville, Ohio, resident participated in the change of command in ceremonies at Andrews Air Force Base near Washington, D.C.

In his new post, Capt. Batthauer is responsible for the activities of some 500 Naval Reserve officers and men stationed at detachments located in Washington, D.C., Philadelphia, Pa., and Detroit, Michigan.

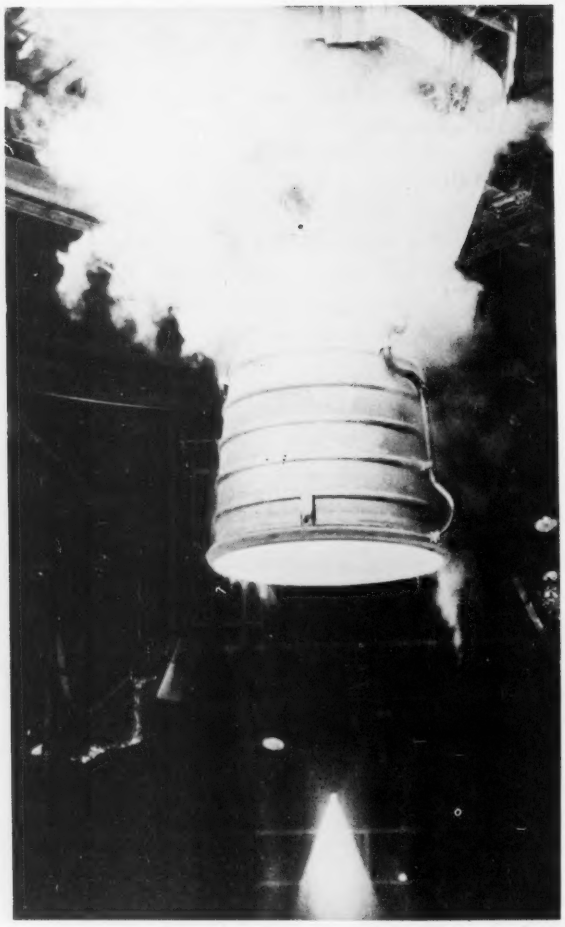
The squadron's 10 multi-engine air transports operate around the clock seven days a week and provide support for U.S. Naval Fleet commitments throughout the U.S., Europe, the Pacific and the Far East.

"For the past five years, the Detroit detachment has provided air logistics support for operation UNITAS, a multi-nation anti-submarine warfare exercise conducted annually in the Caribbean and South America," said Batthauer, a 25-year veteran of the Naval Reserve. He added that the Caribbean and South American assignment requires aircraft, crew and ground support personnel to be on station for a five-month period. "Fleet Logistics Squadron 52 is the only reserve squadron to provide that support," Batthauer said.

The Squadron, a recent winner of the Noel Davis Trophy for excellence, also regularly deploys aircraft, crews and ground support personnel to Rota, Spain in support of the Mediterranean Fleet.

Batthauer's NASA assignment is with the center's wind tunnel and flight division.

Romping at Kennedy—"Romper Room," a nationally syndicated TV series for children, filmed several episodes at KSC recently. Four Melbourne, Fla. youngsters helped in the filming and are pictured in front of one of the Spaceport sites filmed. The kindergarten youths are, left to right: Marlo Creece, Aretha List, Charles Buchanan and Brian Burns.

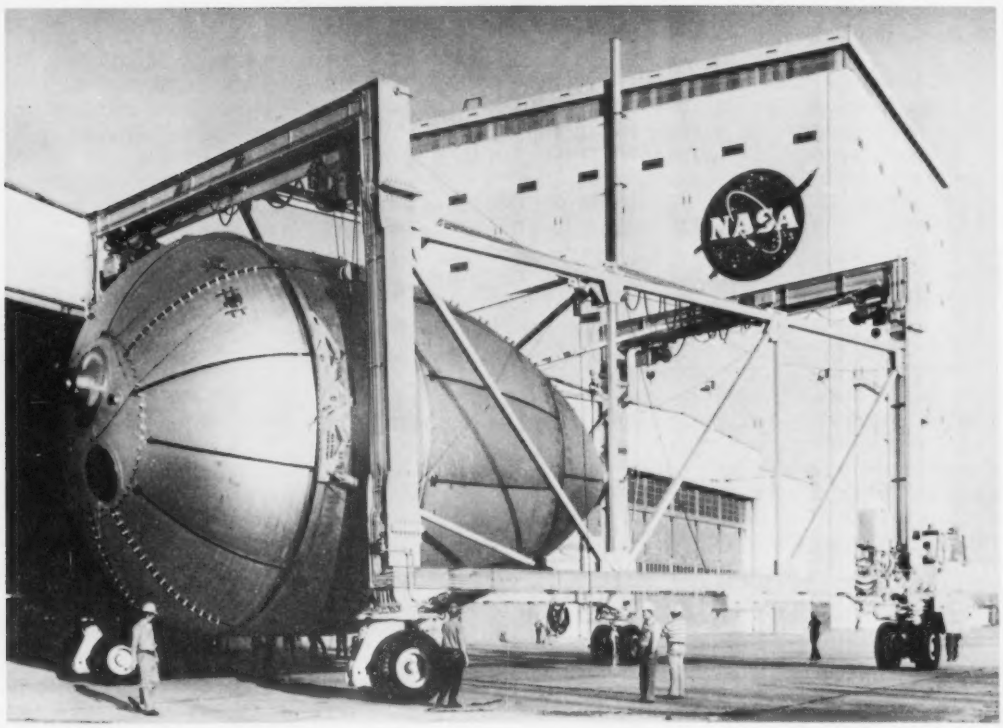


A Shuttle Milestone—The first Space Shuttle main engine has been tested successfully at rated thrust conditions for 60 seconds with a total test duration of slightly more than 80 seconds. A major Shuttle project milestone, the firing was conducted by Rocketdyne Co. personnel under direction of the Marshall center at NASA's National Space Technology Laboratories. It was achieved on Engine 0003 in A-1 sea-level test position. This is the first rocket engine designed for repeated use and the first engine controlled by computers. Operating at high combustion pressures, it is more powerful for its size than any rocket engine previously developed. Designed to provide 7½ hours of flight operation and 55 re-uses before overhaul, it will burn for approximately 8½ minutes during a nominal Shuttle mission. It produces 470,000 pounds of thrust at rated vacuum conditions.

Widow of Veteran Flier Visits Langley—Mrs. Thomas Carroll, 88, and Don Hearth, Langley Research Center director, pause by a photograph of the late Thomas Carroll, the first civilian test pilot for NASA's predecessor, the National Advisory Committee for Aeronautics. Carroll, a test pilot, flew with unbalanced wings, made hard land and water landings to test the structural integrity of planes, dove with full power on, and flew long distances at full throttle near the ground to determine ground effects.

Shuttle Insignia—This circular emblem, in red, white and blue, recently was designated the official insigna for the Space Shuttle approach and landing test flights. A picture of the orbiter, *Enterprise*, is superimposed over a red triangle, which in turn is superimposed over a large inner circle of dark blue. The surnames of the crew members are in white on a field of blue.

U.S. Space Effort on Display—The Japanese Ambassador to the United States, the Honorable Fumihiko Togo and Mrs. Togo toured NASA's Marshall center recently and were shown mockups of Skylab and Spacelab. Richard G. Smith is explaining a model in this photo.



Vital Part of Space Shuttle Passes Test—The first completed liquid oxygen tank for the Space Shuttle's external tank moves toward the vertical test area at the Marshall center's Michoud facility in New Orleans, where it recently underwent proof pressure testing. The black strips along the sides are made of a special moisture sensing material that detects minute leaks at the weld joints. All tanks—manufactured by the Martin Marietta Corp.—will undergo similar proof testing before flight. This tank will be used in MSFC's main propulsion test program at the National Space Technology Laboratories (Miss.) starting in December 1977.

Another Dividend from Air and Space

Research and development in aeronautics and space have provided numerous benefits for all Americans—and at a tiny percentage of the tax dollar. Here is an example:

An Emergency Medical Console

Communications and biomedical engineers at NASA's Johnson Space Center have designed and built a prototype emergency services communications unit which has been installed in the Odessa Medical Center Hospital, Odessa, Texas. The hospital is one of the several medical facilities in the Permian Basin Emergency Medical System (in West Texas oil-well country) and is the medical "control center" for the 17-county system.

The Johnson center effort was initiated in response to a request to Dr. Christopher S. Kraft, Jr., JSC director, from officials in the Texas Governor's office.

The communications console, slightly larger than an electric typewriter, was built from commercially available components and includes all emergency medical system communications functions needed for a regional hospital. In the radio section of the console, easy-to-operate controls allow a physician or nurse to consult with local or regional ambulance drivers and paramedics, and with other hospitals, to receive incoming electrocardiograms, to set up a radio-to-telephone patch, and to page hospital staff members.

The telephone system includes a hotline from the resource control center of the emergency medical system; an automatic dialer for special-care centers and other facilities in the Permian Basin network; incoming or outgoing electrocardiographic data for cardioscope displays and strip recorders between hospitals; and a hospital intercom terminal.

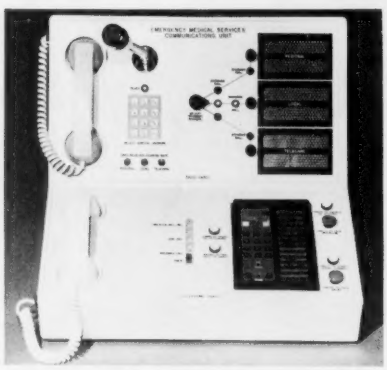
The integrated system also will provide radio and telephone links to local disaster and civil defense organizations as well as the emergency "911" dial net control point.

The need for integrated system communications services and facilities is now recognized as an essential part of the medical services delivery system for urban, metropolitan and regional areas so that patients in critical condition can be treated at the scene and during movements to the hospital. Advances already have been made in many urban and some rural areas for the care of sick or injured people through use of advanced life support system technology derived from aerospace research.

In many parts of the country, initial evaluation and treatment facilities for critical patients have been extended to satellite or specialized units in outlying areas. Adequate communications and telemetry capabilities to support these units are an essential element of a regional medical system's operational "command and control" center such as the one in Odessa.

During field testing in the Odessa Medical Center over the next year, NASA engineers will provide assistance to evaluate the performance of the console. When the system is fully operational and in regular service, it will be inspected and evaluated by other regional officials and health professionals from throughout the country.

Complete sets of design and manufacturing drawings for the console are expected to be available to emergency medical system organizations this month. The technology utilization office at the Johnson center will assist regional groups to prepare suitable performance specifications of consoles to meet specific needs of particular regions.



A close-up view of the medical communication console at the Johnson Space Center.

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U. S. GOVERNMENT PRINTING OFFICE : 1977 241-025/8